

**Critically Ill Older Adults Respond to the Usability of an Assistive Communication  
Application on an Electronic Tablet**

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## Introduction

More than five million patients are admitted annually to intensive care units (ICU) in the United States (Society of Critical Care Medicine (SCCM), 2016). Respiratory insufficiency/failure is the chief diagnosis among the top five ICU admission diagnoses, which include postoperative management, ischemic heart disorder, sepsis, and heart failure (SCCM, 2016). Critical illness treatment often involves mechanical ventilation typically ranging from 16-37 days of treatment for respiratory failure (Nelson, Cox, Hope, & Carson, 2010). Mechanical ventilation is associated with impaired communication, which can be overwhelming, distressing, and frustrating for patients (Happ et al., 2011). Impaired communication limits the patient's ability to express concerns that are important to them such as the presence of pain, requests to speak with the doctor, and concerns about death and dying. In addition, patients who are mechanically ventilated often require sedation and pain medication to treat discomfort. The sedating effects of these medications further complicate communication for patients. In order to promote patient-centered care, studies are needed to determine effective communication strategies and techniques, particularly among older adults who are at greatest risk for communication problems (Balas, Casey, & Happ, 2012)

Older adult patients ( $\geq 65$  years old) incur 55.8% of all ICU days (De Rooij Abu-Hanna, Levi, & de Jonge, 2005). The population younger than 65 years of age is predicted to grow by about 10% between 2000 and 2020 while, by comparison, the population 65 years and older is expected to increase by close to 50% (SCCM, 2016). Although age alone is not an etiological factor for critical illness, age-related physiological changes may leave older patients more susceptible to various geriatric

syndromes (e.g., delirium, functional disability) and diseases, such as cancer, cardiovascular disease, and chronic obstructive pulmonary disease. Older adults are particularly vulnerable and are more likely to be admitted to a hospital setting as a result of declining health and increased risk of developing critical illness. This vulnerability may influence critical care admissions of this population (Balas, Casey, & Happ, 2012). In addition, older adults experience nonpathologic age-related changes that can lead to decrements in communication function, including alterations in hearing and vision (Balandin & Morgan, 2001). Older adults have a desire for social involvement, however hearing and vision changes that accompany the aging process can severely impair necessary interactions (Charness, Parks, & Sabel, 2001). Given the increasing numbers of older adults requiring critical care services and the communication vulnerability associated with aging, there is an increased need for evidence on best methods to improve communication with older adults admitted to intensive care settings.

### **Background of the Problem**

There is a general consensus in nursing that effective communication with patients is a cornerstone for good practice, regardless of the care setting or target population (Finke, Light, & Kitko, 2008). When considering effective communication between a nurse and a patient, it is imperative to account for the communication skills and abilities of both parties involved in the exchange. First, nurses are not routinely trained in communication assessment and assistive communication strategies (Radtke, Tate, & Happ, 2012). Second, the patient who is receiving mechanical ventilation is considered to have severe communication impairment because he or she has lost the ability to vocally express his or her thoughts, feelings, and concerns. This deficiency can

be defined as, “a condition where speech is temporarily or permanently inadequate to meet all of the individual’s communication needs and the inability to speak is not because of a hearing impairment” (Finke, Light, & Kitko, 2008, p. 2013). Mechanical ventilation creates a physical barrier to communication as it blocks air from passing over the vocal cords thus inhibiting the patient’s ability to vocalize. Physiologic effects of critical illness and side effects of medical interventions create cognitive dysfunction, including sedation, delirium, difficulty concentrating, and short-term memory loss (Nelson, Cox, Hope, & Carson, 2010). When critically ill patients are unable to speak, nurses are their most frequent communication partners and implementers of specialized assistive techniques (Radtke, Tate, & Happ, 2012). In a descriptive observational study of usual care between nurses and intubated/nonvocal ICU patients, trained observers rated more than one-third (37.7%) of communication exchanges about pain as unsuccessful; and patients reported 40% of communication sessions as somewhat difficult to extremely difficult (Happ et al., 2011). These findings indicate the need for improved methods of communication with mechanically ventilated patients in the ICU setting.

One step to improve communication efforts between healthcare providers and critically ill patients when barriers to communication are present is to engage available clinical experts. A speech-language pathologist (SLP) can be a valuable resource for assessment and intervention with critically ill, nonspeaking patients (Radtke, Baumann, Garrett, & Happ, 2011). These clinicians are specially trained in augmentative and alternative communication (AAC), which includes all forms of communication, except oral speech, to express needs and ideas (Ronski & Sevcik, 2016). A SLP can provide AAC suggestions based on their assessment of the patient’s mental (cognitive) and

physical abilities. Strategies for improving communication used in the healthcare setting include an alphabet board, mouthing words, sign language, written-choice conversational strategy, electronic speech-generating devices (SGD), and “partner-assisted scanning technique” (Radtke, Baumann, Garrett, & Happ, 2011). SGD’s, specifically, offer a mode of communication for high acuity patients who temporarily lose the ability to communicate vocally (Happ, Roesch, Garrett, 2004).

A few simple examples of AAC, which the average person employs on a daily basis, are facial expression or body language. For patients receiving mechanical ventilation who are unable to communicate orally, AAC techniques and tools are utilized to improve interpersonal communication. These methods often require the use of tools to compensate for the temporary or permanent impairment of orally expressive communication, such as pencil and paper, a communication board with visual symbols, or an electronic tablet with voice output (Ronski & Sevcik, 2016). By making these tools accessible at the bedside, healthcare providers can incorporate their use into patient-centered care plans, enhancing interpersonal relationships and bringing non-vocal patients into the direct communication with caregivers and family.

Is it possible to provide patients under mechanical ventilation with an AAC method that improves their autonomy and provides them the platform to take an active role within the care team? With the development and wide use of tablet computers, a potential solution to this problem is coming to fruition. Assistive communication programs on iPads improve upon the capabilities of the alphabet boards. This AAC method offers an option that does not require the effort of holding a pen or pencil and writing, a task that seriously-ill patients may be too weak to complete (Finke, Light, &

Kitko, 2008). In addition, tablet computers provide patients with keyboard (typing) and finger writing/drawing options, and voice output. With the increasing presence of tablet computers and AAC applications in the hospital and ICU settings, comes the requirement for current, relevant testing for usability and acceptability.

Augmentative and alternative communication can be utilized to address the communication needs of critically ill older adults. However, age-related sensory changes may affect a patient's ability to effectively use electronic communication devices, such as touch-pad tablet computers. Decreased fine motor skills, declining visual acuity, and lack of exposure to recent advances in electronic devices are potential barriers to device use and adoption for older adults. Gatto and colleagues (2008) examined the feelings of older adults about computer use to determine barriers to their success and ultimate enjoyment of this technology. Results showed frustration among participants regarding the length of time it took them to learn computer skills, physical and mental limitations such as difficulty retaining information and carpal tunnel syndrome of the hands and fingers, slowness in comprehending instructions, and the need for re-learning with changes in computers and software (Gatto & Tak, 2008). Given these potential limitations, it is necessary to create and test AAC device options that are user-friendly and well-accepted by critically ill older adults.

### **Purpose of the Study**

The purpose of this study was to explore age as a factor that may affect usability of an assistive communication application (VidaTalk<sup>TM</sup>) features on an electronic tablet (i.e. iPad) among adult ICU patients. The following questions were addressed in this study:

- (1) How do patient perceptions of usability of the VidaTalk™ application differ for older (>60) and younger (<60) ICU patients?
- (2) How do patterns of performance on the VidaTalk™ application differ for older and younger ICU patients?

### **Significance of Study**

This study is significant because with current technological advances in assistive communication aids there is an increasing presence of these tablet applications in the hospital setting. It is important to explore the usability of these tools as they are being implemented into care plans. Iterative testing of the usability and acceptability of the VidaTalk™ iPad application with acute and critically ill hospitalized patients will guide adaptations to improve the effectiveness of this tool in facilitating patient-provider communication interactions.

### **Research Question**

How do a small, convenience sample of older adults, recently liberated from mechanical ventilation in intensive care settings, respond to an assistive communication application (VidaTalk™) feature on an electronic tablet (i.e. iPad), in contrast with their younger counterparts?

### **Definition of Terms**

Older Adult: a person aged 60 or older

Younger Adult: a person aged 18 to 59 years

Usability: assessment for ease-of-use and user performance (i.e., task time, error rate)

Acceptability: assessment for meeting the needs of the user based on user comments, perceptions/satisfaction and continued use

**Limitations**

The small sample size of 15 participants limits this study to exploratory analysis rather than a determination of statistical significance. In addition, the participants were all receiving care at a single site, which means that the sample may not be as diverse or representative of the population of critically ill adults. This study is also a secondary analysis; therefore, the exploration was limited to the data and patient responses collected in the primary study. To moderate the inability to clarify information or interact directly with the patients in the primary study, I worked firsthand with the primary researcher, Dr. Happ. Another factor that played a role in this study was the improvements applied to the VidaTalk™ system between the first group of 7 participants and the second group of 8 participants. As part of the iterative technology development design of the parent study, the small business technology partners (Vidatak, LLC) used the suggestions and feedback on usability from the first group to make improvements to the design of the VidaTalk™ tool.

**Research Design**

This study is a secondary analysis of patient demographics, performance measures, and transcribed field notes from Dr. Happ's primary study evaluating the usability and acceptability of the prototype VidaTalk™ assistive communication tool with mechanically ventilated ICU patients (1R41NR014087-01). Both qualitative and quantitative data were employed to provide a comprehensive understanding of the patients' response to the usability of the VidaTalk™ app.



### **Population and Sample Design**

This was a convenience sample of 15 participants: 7 participants from Group 1 and 8 participants from Group 2. Group 1 used the initial prototype, while Group 2 used an improved model. Participants were recruited from the Intensive Care Units at the Ohio State University Health System.

The **inclusion criteria** for the primary study included:  $\geq 21$  years old, able to communicate in English, newly extubated within 72 hours and normal (aided or unaided) hearing and vision. The patient must also be awake and alert, able to control arm and head movements, physiologically stable and in no acute distress and has memory of their ICU experience. The **exclusion criteria** for the primary study included: pre-existing communication or memory impairments, diagnosis of dementia or brain injury, Confusion Assessment Method positive for delirium, and unresponsiveness or inattention.

The charge nurse or critical care clinical nurse specialist identified potential participants on weekdays (Monday – Friday), which means that not every eligible patient admitted to the ICU was screened. Participants were approached on days that research staff was available.

### **Data Collection Instruments**

The measures obtained for the primary study included: demographics, acute physiology age and chronic health evaluation (APACHE) III, intubation history, user needs, After-Scenario Questionnaire (ASQ), audio-recorded “think aloud” feedback, observation notes, task time, task success, and errors. The data collection began by introducing the patient to the VidaTalk™ iPad application followed by the participants

being asked to activate a series of messages on the touch screen. The messages in the usability testing sequence are listed in **Table 1** below:

Test Messages
1. Tell me you are having pain.
2. Where are you having pain?
3. Can you rate the pain?
4. Write your favorite color by drawing with your finger.
5. Tell me you are tired.
6. Ask to see the doctor.
7. Type. How are you?

Observers recorded semi-structured field notes of their observations, which included completion time for each communication message/task, errors, type of errors, time from error to completion, and patient position.

In the primary study, patients were also asked to complete a 3-item After-Scenario Questionnaire. This included a Likert rating scale (1-7) of ease, support and time. The patients were offered the opportunity to share any suggestions they had for improvement of the VidaTalk™ application.

The main instruments for qualitative data collection were the researchers themselves. In the primary study, researchers were trained for proper data collection and documentation of field notes for the usability testing performed with each participant.

**Data Management and Analysis.** Audio recordings of the usability testing sessions were transcribed verbatim and reviewed for accuracy and transferred to ATLAS.ti, qualitative research database. For the secondary study, I was the key instrument for analysis; I was trained and prepared by Dr. Happ, the primary investigator, in order to be an educated researcher. I was oriented to the data set, collection tools, and basics of qualitative analysis. Two categories of data were evaluated: patient perception and performance measures. A list of relevant codes was developed to describe elements of

patient usability. Three researchers collaborated to develop and refine the codes and code definitions. This same group worked line-by-line through the transcribed field notes and performed continued refinement to highlight applicable and agreed upon codes of usability. Two of the three researchers working together in this process (Dr. Happ and Dr. Tate) are expert qualitative researchers.

## Results

**Table 2** shows demographic characteristics of the study sample. A total of 15 newly extubated patients participated in the study, 7 men and 8 women, 22 to 75 years of age. Seven patients (4 men, 3 women) were older adults (> 60 years). The younger adult cohort ranged in age from 22 to 58 years, while the older adult cohort ranged in age from 62 to 75 years.

Table 2. Sample Demographics

	<60 years	>60 years
<b>Sex</b>	3 Males 5 Females	4 Males 3 Females
<b>Race</b>	7 White 1 Other	7 White
<b>Total (15)</b>	8	7

Two main patient perceptions identified through qualitative analysis of the transcribed field notes were “*easy*” and “*suggestions*.” Additionally, two main patient performance codes describing usability were: “*assistance*” and “*finger error*.” These codes were identified via the transcribed field notes and researcher observations. Percentages of need for assistance were computed from total number of messages for each group ( $x/7N$ ).

“*Assistance*” describes a patient’s need for support from the nurse through additional direction, cueing, and repositioning to accurately activate the test message.

Older adults required assistance for 51% of the total message tests compared to younger adults who required assistance for 21% of the tests (Figure 1). In addition, older adults were observed to have made *finger errors* during 59% of the test messages while their younger counterparts were observed at only 14%. “*Finger error*” identifies times when the patient made an error relating to touch pressure, location, or technique. A third patient performance measure was the researcher-recorded times for completion of each communication task. Results showed that older adults required almost three times longer to complete each task than younger patients, with an average completion time of 33.38 seconds per task compared to 12.09 seconds per task (Figure 2). Younger adults, more often, rated usability as “*easy*” and made less “*finger errors*” than their older counterparts. During the think aloud performance session and at completion of data collection, the younger participants collectively reported ease of use 25 times, while the older adult cohort reported ease of use only 8 times throughout all tasks.

Qualitative analysis revealed patient *concerns* and common participant *suggestions* for device improvement. One patient shared that the questions he most wanted, but was unable, to communicate during mechanical ventilation was, “Am I going to die?” “Do I need my family here, am I going... am I bad? Adults want to know that. If you are bleeding, they know. I want to know.”

Patients readily offered suggestions for improving usability of the tablet application. For example, in relation to the “Where are you having pain?” message task, patients suggested providing greater specificity in body part selection—“it doesn’t differentiate between left and right,” “Let’s try again and see if it has throat. No, so it’s

giving face when he's hitting throat," and "Where my belly pain, I wasn't able to show you where my pain is there. I wanted to say upper right quadrant."

## Conclusions

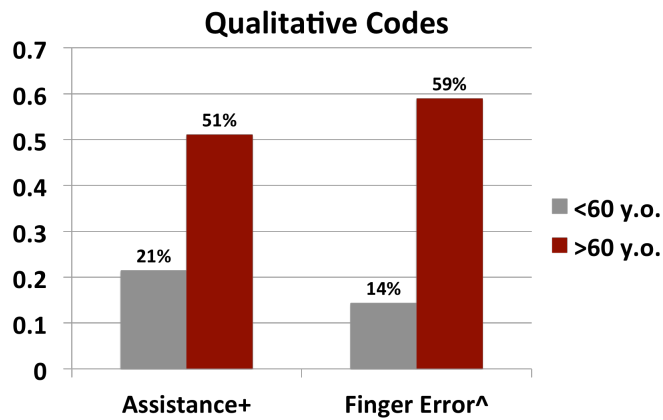
In conclusion, although the critically ill older adults self-rated their personal technological abilities lower than the ratings young adults gave themselves (Figure 3), older adults are able to successfully use the VidaTalk™ application with assistance. The Study of Patient-Nurse Effectiveness with Assisted Communication Strategies (SPEACS) and the SPEACS-2 study tested a program where nurses were educated in communication impairments associated with aging and critical illness, which can influence the effectiveness of use for older adults in the ICU setting, including alterations in vision and hearing, delayed motor abilities, muscle weakness, and delirium (Happ et al., 2014). In our study, such needs for assistance were addressed primarily in the form of cueing and positioning. An increased need for cueing in the older adult population compared to a younger cohort was also reported in the study *Aging and the Use of Electronic Speech Generating Devices in the Hospital Setting*, which focused on the use of SGD's (Happ, Roesch, Kagan, Garrett, & Farkas, 2007).

Qualitative findings highlighted serious concerns that patients were unable to communicate during mechanical ventilation. One key statement was the question: "Am I going to die?" It is shocking when one acknowledges the fact that a patient may have distressing thoughts and lack the ability to vocalize these feelings to the healthcare team or family members. With available AAC technology, voiceless patients are provided the opportunity to contribute to discussions about healthcare decisions and communicate end of life messages (Radtke, Baumann, Garrett, & Happ, 2011). In addition to statements

about patient concerns, researchers also elicited patient suggestions for improving usability of the tablet application. These suggestions provide user-centered improvements in the tablet application and, ultimately, a user-friendly interface.

### **Implications of Study**

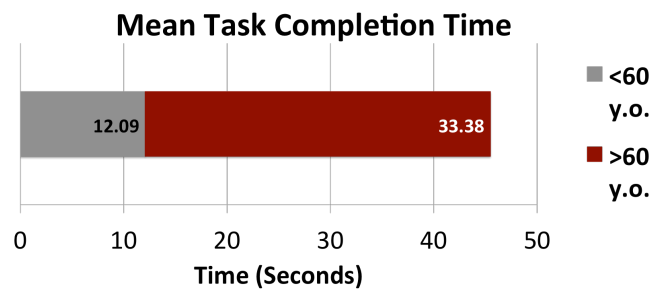
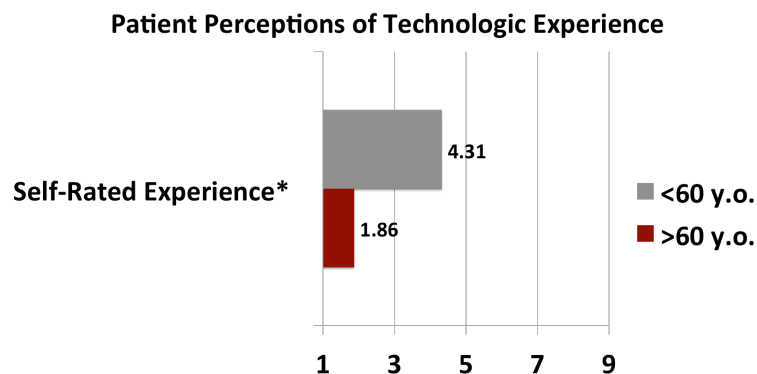
This knowledge can be applied to the clinical setting, when possible, with clinicians providing teaching about the AAC tool prior to intubation to improve usability of the device when patients are of a higher acuity. In addition, older adults may require frequent reminders, cueing, and review; nurses should allot the necessary time for patient-centered communication into the care plans to assist with ease of use. In addition, we feel that future work should be done to implement an educational tool or course for nurses and other health care providers to learn about the iPad application as an AAC tool. One fear is that, when implemented into the clinical setting, these tablets will sit unused at the bedside because providers do not feel prepared to effectively use these assistive techniques. Bedside nurses receive little to no training on the proper use of AAC tools with mechanically ventilated patients (Happ et al., 2014). The Study of Patient-Nurse Effectiveness with Assistive Communication Strategies (SPEACS) found that utility of communication skill training and educational materials increased the frequency of nurse-patient communication in the ICU setting (Happ et al., 2014). It is important for clinicians to understand the best, evidence-based methods for providing assistance to promote usability and positive communication interactions for this non-vocal patient population.

**Matrices:****Figure 1:**

\*\*Percentages were computed from total number of messages for each group (x/7N).

+Assistance= cueing, positioning, etc.

^Finger error= touch pressure, location, and technique

**Figure 2:****Figure 3:**

\*Scale: 1-very inexperienced to 9-very experienced

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